

## A Standard for Openness

AS ANY ARCHITECT OR GARDENER CAN ATTEST, THE DESIGN and construction of a proper glass house requires ingenuity and creativity; maintaining one requires a more prosaic investment of time, attention, and resources. It's not the stark beauty of the glass-walled Janelia Farm Research Campus—or even the fact that an icon of modernism, Philip Johnson's glass house, is about to turn 50—that prompts these reflections. Rather, I am inspired by Nobelist Max Perutz, who famously remarked, “True science thrives best in glass houses, where everyone can look in.”

That quotation summarizes the conclusions of a National Research Council committee, which I chaired, that was charged with taking a fresh look at the responsibilities of scientists to share the data and materials referenced in original research articles. Our 2003 report articulated a concept that we dubbed UPSIDE—the Uniform Principle for Sharing Integral Data and Materials Expediently.

Scientists publish to disclose their discoveries and get credit for making them. In exchange, authors are expected to demonstrate good behavior in the scientific playground—that is, to share research materials in a timely and useful fashion—because that's what enables their colleagues to validate the research and to use the knowledge as a foundation for new discoveries.

We have long required Howard Hughes Medical Institute investigators to share their published research materials to the extent possible. In 2003, we instituted a formal policy that sets out our expectations for adherence to UPSIDE in the clearest possible terms. The policy, which now extends to scientists at Janelia Farm, reflects the value we place on full participation in the scientific community and the discovery of knowledge.

Sharing may be essential, but ensuring that it occurs is no simple matter when academic and commercial interests collide or when colleagues simply decline to supply research materials because they lack the time, resources, or interest. We recognize that HHMI investigators experience many frustrations in living up to this policy. They tell us that preparing mice and other reagents is time-consuming, that many researchers don't reciprocate, that it can be difficult to gain access to a computer program's source code, and that many barriers limit the sharing of derivatives created from someone else's material. We have a number of initiatives under way aimed at alleviating the burden on HHMI investigators and facilitating sharing.

One example is a collaborative agreement with the Jackson Laboratory that ultimately should streamline the process of sharing mouse strains developed by HHMI scientists with other laboratories. Although we have no ready-made solutions for encouraging greater acceptance of the upside of UPSIDE outside HHMI, we are giving thought to the ways in which intellectual property policies writ large may impede the ability of scientists to share reagents, tools, and data. Stay tuned.

True science—to borrow once again from Max Perutz—also benefits when research articles are freely available after publication. As an extension of our commitment to the free distribution of research materials, the Institute is actively considering a policy that would require our scientists



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to publish original research articles only in those journals that make the articles freely available within six months through PubMed Central, the repository maintained by the National Library of Medicine. Toward that end, we have spent the past several months consulting with HHMI investigators, journal publishers and editors, scientific societies, and international colleagues. The conversations have been lively, energetic, and always instructive. Recently, we reached an agreement with Elsevier under which we will pay to have manuscripts by HHMI scientists in Elsevier and Cell Press publications deposited directly into PubMed Central after six months. We expect other agreements to follow.

Currently, only the Wellcome Trust in the United Kingdom requires its grantees to publish in journals that make content freely available within six months. Although the National Institutes of Health has established a voluntary policy for its grantees, the number of papers deposited in PubMed Central has fallen short of what many had envisioned. We hope that HHMI's policy will enable public access without sacrificing the important principles that underlie scholarly freedom. This matters not only because our scientists produce more than 1,000 original research articles a year and collaborate with colleagues from around the world but also because our approach may contribute to a new uniform standard for public access to scientific publications. After all, if the scientific community requires UPSIDE for published materials, databases, and software, there is certainly an additional upside to making the publications themselves readily available.

FOR MORE INFORMATION: The NRC report, *Sharing Publication-Related Data and Materials: Responsibilities of Authorship in the Life Sciences*, can be found at [www.nap.edu](http://www.nap.edu). For HHMI's policy on sharing research tools, visit [www.hhmi.org/about/ogc/policies.html](http://www.hhmi.org/about/ogc/policies.html).